7 March 1980

MEMORANDUM FOR: Suggestion & Achievment Awards Committee

SUBJECT : Energy Conservation at Headquarters and Other CIA/Federal Buildings

Attached is a suggestion for significantly reducing the energy consumed in heating and cooling the headquarters building. This suggestion is probably also applicable with small modifications to other Agency buildings and to other federal government buildings in general. The costs would not be high; for headquarters they probably would be less than what is presently being spent to redecorate the cafeteria complex. Thank you for considering this suggestion. I am available for consultation on this matter as well as upon energy conservation measures generally.

SUGGESTION

I. The Problem

Energy conservation is a key national priority, yet the CIA headquarters building is a heat sieve designed and built in the era of cheap and inexhaustible energy. On the 1st, 3rd, 4th, 5th, and 6th floors there are nearly 3,500 windows, each one of which loses about 2.75 million btu's per heating season, requiring the burning of 25-28 gallons of heating oil per window per heating season. About 80 percent of this heat loss is pure waste. At today's oil prices of roughly $1-/gallon this amounts to a cost of $20/window/year or $70,000. Since heating oil prices promise to double in the next 2-3 years, savings would amount to about $150,000 per year in the mid 1980s. Summer air conditioning savings would also be sizeable, perhaps $50,000 to $75,000.

II. The Solution

Because of the large number of identical windows, it will be possible to mass produce styrofoam insulated shutters to fit on the inside of each of these windows. These shutters would not interfere with the operation of the windows or illumination during working hours, nor would they intrude on available space within agency offices. Closing of these shutters could be made a portion of the normal daily security check, thus assuring a 90 percent reduction in heat losses during the 75 percent of the week that most offices are normally unoccupied. Since heat losses are much higher at night than during the day, in part because of radiation losses, overall savings would average 80 percent or so.

III. The Shutters

These proposed shutters would hinge on each side of the windows on the inside and open against the concrete columns alongside each window, much like french or double doors. Shutter construction would probably call for a styrofoam core bonded to fibreglass or plastic sheets (much like high quality ice chests are manufactured) with weather stripped closures. Design should aim at an "R" value of 8 to 10 per shutter, implying a core

thickness of about 1 1/2". Based on a competitive bid order of some 3,500 units, costs should run less than $50- per unit. Installation costs should not exceed an additional $50 per unit. A particularly cheap, but less esthetically pleasing solution could be obtained by using lift out styrofoam panels with magnetic catches that would seal on the window frames. This could probably be done for as little as $10-$20 per window, with a payback period of less than one heating season. These lift-out panels would also be useable on the 2nd and 7th floors.

IV. The Payoff

With annual savings on heat alone of $20-/window (probably $30-$40/window taking into account air conditioning savings and the probable rise in fuel costs during the interim) payback could be obtained in 3 years or less. Total annual savings would total at least $100,000 next year in heating costs and more than $150,000-/year during the 1980s. Other conservation investments could be made on the 2nd and the 7th floor where heat losses through the windows are greater even than on the other floors. Again, insulated shutters of some kind probably offer the best solution. Double glazing would be more expensive and would save only about 50 percent at best, compared to the 80 percent or so available from shutters. As for the cafeteria, which is an energy disgrace, no solution suggests itself. For your information, it probably takes more energy to heat this area than it does for the entire rest of the headquarters complex.

Appendix A

Heat Loss Calculations

Each window on 3rd, 4th, 5th, & 6th floors

Heat Loss by Conduction

Dimensions 2.7' x 7'5'

Glass Area 20.6 ft^2/window

Heating Degree Days - Washington DC = 4,200

Langley, Va = 4,500

= 4,500 x 24 hrs x 20.6 x 1.13

= 2,514,024 btu's/window/heating season

Heat Loss Through Infiltration

Along window edge length (crack) at assumed average winter wind velocity of 5 mph

15' crack/window/

infiltration = 8 ft^3/hour/linear foot

Total infiltration equals 120 ft^3/hour, or

518,000 ft^3/heating season

Heat Loss = 518,000 x 25°F (average ΔT)

x 0.018 btu/ft^3/°F

= 233,100 btu's/window/heating season

Total heat loss per window = 2,750,000 btu's